

What is claimed is:

See
Claims
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1. A heat transfer fluid mixture consisting essentially of a heavy gas selected from the group consisting of nitrogen, argon, carbon dioxide, and mixtures thereof, and a light gas selected from the group consisting of hydrogen, helium, and any mixture thereof.
2. The heat transfer fluid mixture of claim 1 wherein the light gas has a concentration ranging from about 20 mole percent to about 99 mole percent.
3. The heat transfer fluid mixture of claim 1 wherein the light gas has a concentration ranging from about 30 mole percent to about 98 mole percent.
4. The heat transfer fluid mixture of claim 1 wherein the light gas has a concentration ranging from about 40 mole percent to about 97 mole percent.
5. The heat transfer fluid mixture of claim 1 wherein the light gas has a concentration ranging from about 50 mole percent to about 96 mole percent.
6. The heat transfer fluid mixture of claim 1 wherein the light gas has a concentration ranging from about 60 mole percent to about 95 mole percent.
7. The heat transfer fluid mixture of claim 1 wherein the heavy gas has a concentration ranging from about 1 mole percent to about 99 mole percent.
8. A method of cooling an item, the method comprising contacting the item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

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9. A method of cooling an item, the method comprising contacting the item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
10. A method of cooling an item, the method comprising contacting the item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
11. A method of cooling an item, the method comprising contacting the item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
12. A method of cooling an item, the method comprising contacting the item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
13. A method of cooling an item, the method comprising contacting the item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
14. A method of heating an item, the method comprising contacting the item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
15. A method of heating an item, the method comprising contacting the item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

16. A method of heating an item, the method comprising contacting the item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
17. A method of heating an item, the method comprising contacting the item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
18. A method of heating an item, the method comprising contacting the item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
19. A method of heating an item, the method comprising contacting the item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
20. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
21. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.
22. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

23. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

5 24. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

10 25. A method of cooling an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

15 26. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

20 27. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

28. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

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29. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

5 30. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

10 31. A method of heating an item traversing through a substantially confined space, the method comprising contacting the item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

15 32. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

20 33. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

34. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

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35. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

5 36. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

10 37. A method of cooling a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

15 38. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

20 39. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

40. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

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41. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

5 42. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

10 43. A method of heating a substantially cylindrical item traversing through a substantially confined space, the method comprising contacting the substantially cylindrical item with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

15 44. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 1, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

20 45. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 2, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

46. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 3, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

47. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 4, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

5 48. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 5, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

10 49. A method of cooling a substantially cylindrical optical fiber traversing through a heat exchanger, the method comprising contacting the optical fiber with the mixture of claim 6, said contacting selected from the group consisting of directly contacting the item, indirectly contacting the item, and combinations thereof.

15 50. A method of improving the cooling of a substantially cylindrical optical fiber traversing through a heat exchange device, the method comprising the steps of: contacting the optical fiber with the heat transfer fluid mixture of claim 1, said contacting selected from the group consisting of directly contacting, indirectly contacting, and combinations thereof; and making an adjustment, either intermittently or continuously, of a parameter during the cooling, the parameter selected from the group consisting of composition of the heat transfer fluid mixture, flow rate of the heat transfer fluid mixture into the heat exchange device, an amount of heat transfer fluid mixture contacting the fiber in counter-current fashion, an amount of heat transfer fluid mixture contacting the fiber in co-current fashion, composition of the heat transfer fluid mixture contacting the fiber in counter-current fashion, composition of the heat transfer fluid mixture contacting the fiber in co-current fashion, a temperature of the heat transfer fluid mixture being injected into the heat exchange device, a temperature of the heat transfer fluid mixture before contacting the fiber in counter-current fashion, a temperature of the heat transfer fluid mixture during contacting the fiber in counter-current fashion, a temperature of the heat transfer fluid mixture after contacting the fiber in counter-current fashion, a temperature of the

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heat transfer fluid mixture before contacting the fiber in a co-current fashion, a temperature of the heat transfer fluid mixture during contacting the fiber in a co-current fashion, a temperature of the heat transfer fluid mixture after contacting the fiber in a co-current fashion, a pressure of the heat transfer fluid mixture injected into the heat exchange device, a pressure of the heat transfer fluid mixture contacting the fiber in countercurrent fashion, and a pressure of the heat transfer fluid mixture contacting the fiber in a co-current fashion.

51. A method of improving cooling of an object in contact with a stagnant or flowing gas mixture in a confined space, the method comprising the steps of:

- a) contacting the object with the heat transfer fluid mixture of claim 1, said contacting selected from the group consisting of directly contacting, indirectly contacting, and combinations thereof; and
- b) making an adjustment, either intermittently or continuously, of a parameter during the cooling process, the parameter selected from the group consisting of a composition of the heat transfer fluid mixture, a flow rate of the heat transfer fluid mixture in contact with the object, an amount of heat transfer fluid mixture contacting the object, a composition of the heat transfer fluid mixture contacting the object, a temperature of the heat transfer fluid injected into the confined space, a temperature of the heat transfer fluid mixture before contacting the object, a temperature of the heat transfer fluid mixture during contacting the object, a temperature of the heat transfer fluid mixture after contacting the object, a pressure of the heat transfer fluid mixture entering the confined space, and a pressure of the heat transfer fluid mixture contacting the object.

52. The method of claim 51 wherein said parameter adjustment is made automatically or manually based upon a measured parameter of the object that changes during the cooling process.

53. A method of improving heating of an object in contact with a stagnant or flowing gas mixture in a confined space, the method comprising:

5 a) contacting the object with the heat transfer fluid mixture of claim 1, said contacting selected from the group consisting of directly contacting, indirectly contacting, and combinations thereof; and

10 b) making an adjustment, either intermittently or continuously, of a parameter during the heating process, the parameter selected from the group consisting of a composition of the heat transfer fluid mixture, a flow rate of the heat transfer fluid mixture in contact with the object, an amount of heat transfer fluid mixture contacting the object, a composition of the heat transfer fluid mixture contacting the object, a temperature of the heat transfer fluid injected into the confined space, a temperature of the heat transfer fluid mixture before contacting the object, a temperature of the heat transfer fluid mixture during contacting the object, a temperature of the heat transfer fluid mixture after contacting the object, a pressure of the heat transfer fluid mixture entering the confined space, and a pressure of the heat transfer fluid mixture contacting the object.

15 54. The method of claim 53 wherein said parameter adjustment is made automatically or manually based upon a measured parameter of the object that changes during the heating process.

20 55. A method of making a heat transfer fluid, the heat transfer fluid adjustable between a first composition having high heat transfer coefficient and high cost of use, and a second composition having essentially the same heat transfer coefficient as the first composition but allowing reduced cost of use, the method comprising the steps of:

56. providing a light gas selected from the group consisting of hydrogen, helium, and mixtures thereof, from a light gas source;

25 a) providing a heavy gas selected from the group consisting of nitrogen, argon, carbon

dioxide, and mixtures thereof, from a heavy gas source;

- b) ascertaining a heating or cooling demand; and
- c) combining the light gas and the heavy gas based on said demand.

57. The method of claim 55 wherein said demand is a cooling demand.

5 58. The method of claim 55 wherein said demand is a heating demand.

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